

OVERALL WATER WITHDRAWALS

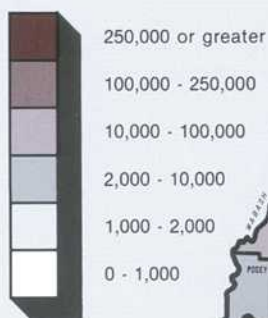
TOTAL 1990 WITHDRAWALS TOTAL = 3,380,906 MG GROUND = 174,282 MG SURFACE = 3,206,624 MG	TOP THREE COUNTIES (1990 WITHDRAWALS) 1) JEFFERSON 2) LAKE 3) DEARBORN
REGISTRATION INFORMATION NUMBER OF FACILITIES = 3,119 NUMBER OF WELLS = 4,710 NUMBER OF INTAKES = 1,398	WITHDRAWAL INFORMATION ENERGY PRODUCTION = 65% INDUSTRIAL = 27% PUBLIC SUPPLY = 7% AGRICULTURAL, RURAL USE, AND MISCELLANEOUS = 1%

SURFACE WATER

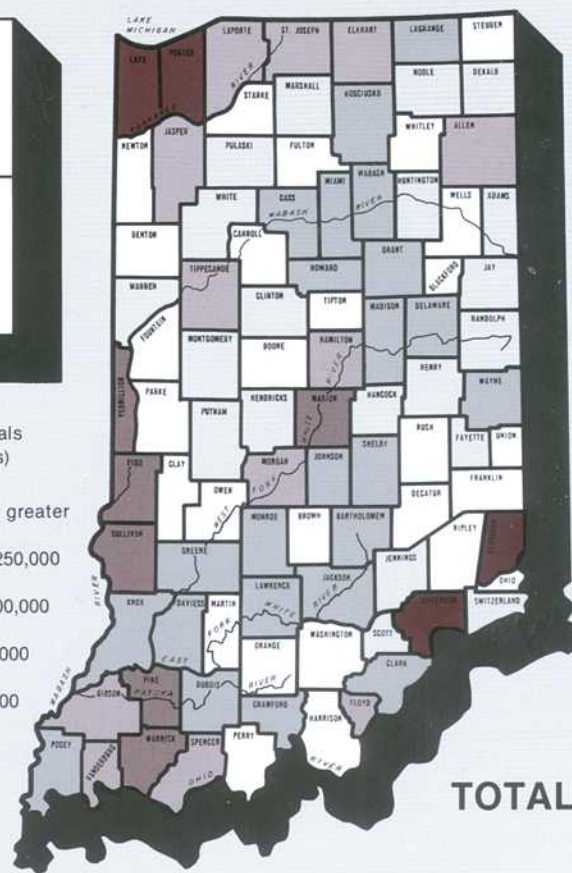
GROUND WATER



Total 1990
Water Withdrawals
(million gallons)



(FIGURE 7)

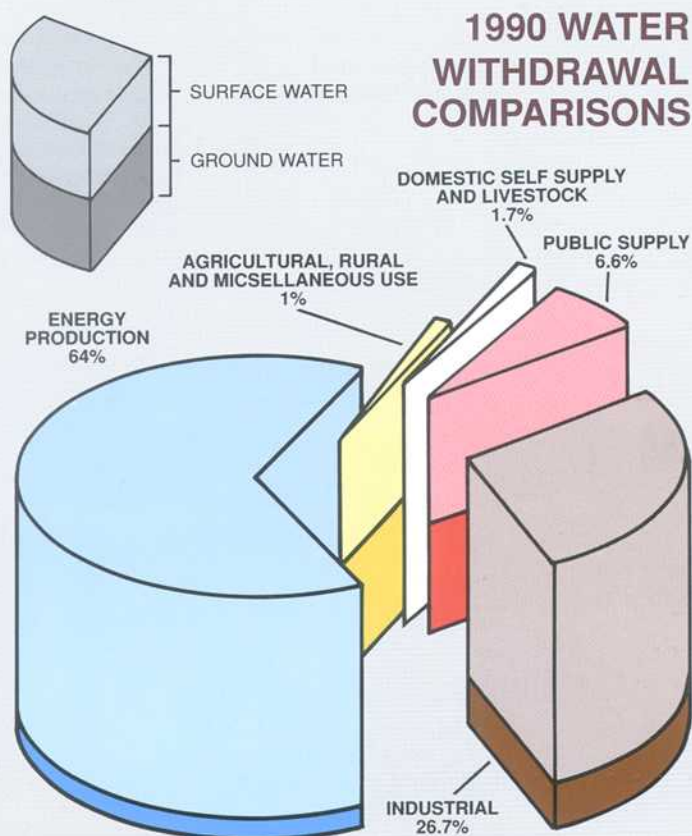


TOTAL

WATER WITHDRAWALS BY EXEMPT FACILITIES

Water withdrawal facilities with capabilities less than 100,000 gallons per day are not required to register or report their annual water use. For this reason, their aggregated water withdrawals have been estimated. Reported water withdrawals by registered facilities as well as estimated withdrawals by registration-exempt facilities are included in Figure 8.

The two major registration-exempt groups are domestic self-supplied and small livestock operations. Daily per-capita estimates for self-supplied water use range from 50-75 gallons for residents of rural areas and up to 100 gallons for urban residents. The total water withdrawn by domestic self-supplied users was estimated to be 130 MGD in 1990. Water withdrawals by small livestock operations were estimated at 36 MGD based on agricultural statistics and available information on per-head water use. The registration-exempt facilities constituted approximately 2% of the total registered and registration-exempt 1990 water withdrawals in the state.



(FIGURE 8)

FIVE YEARS OF WATER USE 1986 TO 1990

GAINING A PERSPECTIVE

The Indiana Department of Natural Resources, Division of Water has been publishing annual reports on water use by Indiana's significant water withdrawal facilities since 1986. As a part of its effort to report on water use in the state, the Division has undertaken a review of the past five years' reported water use. To begin this review, it seems important to gain a perspective on the program and the uses of its data.

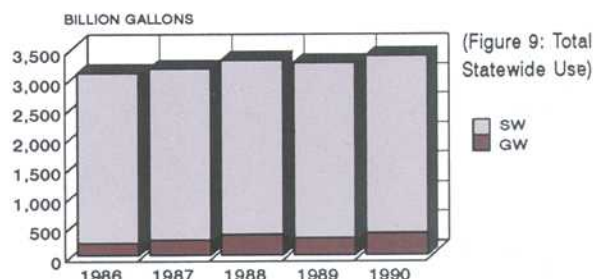
Since 1986, Indiana's Water Use Program has experienced substantial growth, not only in the number of significant water withdrawal facilities identified and registered, but also in the level of public interest in the data collected. The data has been used by a number of public agencies that are involved in water resource related activities. The Division of Water utilizes the information in its water rights investigations and Basin Studies Program. The United States Geological Survey includes the information in its National Water Summary. The data is given to the Great Lakes Commission for its annual report of water use in the region and subsequent planning activities. Other agencies have found it useful for a number of ground water protection programs and the development of contingency plans for hazardous material spills. Consultants have used the water use data for projects such as ground water remediation, evaluation of possible landfill sites, assessment of expected ground water yields and more. Public water suppliers have found the data useful in investigating new supply sources. The water use data has also been used by various agencies for educational purposes.

Even though a variety of uses have been found for the data collected under Indiana's Water Use Program, the numbers for total reported water use should be viewed with some caution. It is tempting, when viewing the five years of data, to look for any trends that may appear in Indiana's water use. However, five years is too short of a period over which to evaluate the existence of such trends. This is particularly true for the period from 1986 to 1990 because a significant number of the facilities registered during that period had been in operation for a number of years prior to being registered. Thus, total reported water use for any of these years will likely be less than the water use that actually occurred. As more previously existing significant facilities were added to the program, the annual total reported water use may have increased, creating the false impression of an upward trend.

Nevertheless, it should be noted that approximately 90% of the total reported withdrawals that occurred from 1986 to 1990 were made by facilities registered prior to 1986. This suggests that most of the largest of Indiana's significant water withdrawal facilities were registered before 1986. Thus, even though the numbers do not necessarily reflect the real total water use, some general trends may be found if some background on the numbers is kept in mind.

STATEWIDE WATER USE

Total reported withdrawals for all of the significant water withdrawal facilities in the state are shown in Figure 9. The most obvious feature of this record is its overall stability. The minimum reported withdrawals were 3.086 trillion gallons in 1986 and the maximum

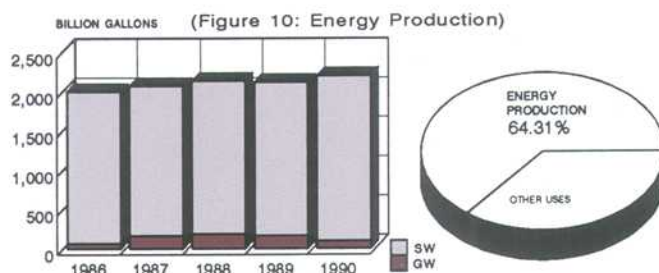


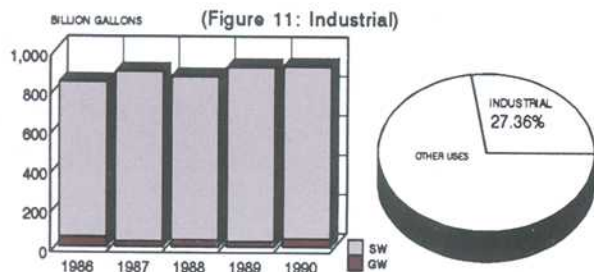
reported withdrawals were 3.377 trillion gallons in 1990. While this represents a 9.4% increase in water use, it must be kept in mind that at least a portion of this increase is due to withdrawals that were unreported in the earlier years of the program.

WATER USE BY CATEGORY

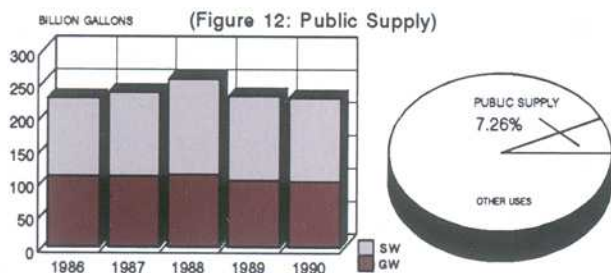
One useful way of examining the water use record is to break it down by category. Each of the sections below present a figure showing the withdrawals that have taken place in that category over the previous five years and the percentage of the total reported water use which that amount represents.

ENERGY PRODUCTION: Figure 10 shows water withdrawals for the energy production category from 1986 to 1990. Ninety-nine percent of the withdrawals in this category were made by electrical power generating stations. The largest electrical power stations in the state were registered prior to 1986; thus, the increasing withdrawals are not due to the registration of a new, large facility. Because 1988 is remembered as a drought year, one might expect the highest withdrawals to have occurred in that year to satisfy increased air conditioning demands. Instead, it appears that the increasing withdrawals are associated with overall increasing power generation by these facilities.





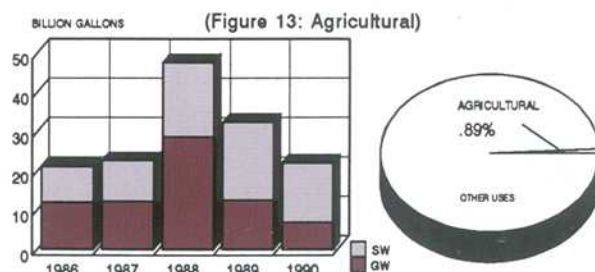
INDUSTRIAL: Industrial water withdrawals over the period from 1986 to 1990 are shown in Figure 11. In 1989 and 1990 a significant number of facilities were registered in this category. However, only one half of one percent of the industrial water use reported in those two years was due to these newly registered facilities. Therefore, the 9.6% increase in withdrawals over the five year period is mostly due to facilities registered in the early stages of the program. A large part of the increase can be attributed to steel and aluminum industries.



PUBLIC SUPPLY: The five year record of water withdrawals in this category is shown in Figure 12. The most obvious feature of this record is the significant increase in withdrawals during 1988. Although a number of water withdrawal facilities were registered under this category after 1988, the great majority were either newly constructed municipal facilities or schools and mobile home parks which have comparatively small water withdrawal capabilities. The public supply totals reported from 1986 to 1990, therefore, show minimal influence by the increased number of registrants. It appears that withdrawals in this category are strongly affected by drought conditions. While it is not possible from the Division of Water's water use records to determine the exact reason for this relationship, experience indicates that at least a large portion of the increase is due to additional watering of lawns and gardens.

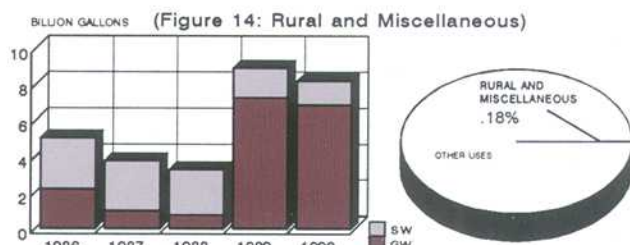
AGRICULTURAL: Figure 13 illustrates the changes in water withdrawals in the agricultural category. The large increase in 1988 appears to be due to the drought that occurred in the state that year. The southern two-thirds of the state received six to ten inches less than normal precipitation during the latter part of 1987 and the first half of 1988, while precipitation deficits did not occur in the northern third of the state until 1988 and 1989.

The great majority of withdrawals for agricultural irrigation takes place in the northern third of the state. One would expect, then, that the relatively higher withdrawals reported in 1989 are due to continued irrigation in the northern third of the state. However, in 1989, the precipitation deficits did not occur during the growing season in the northern third of the state. The increased withdrawals in 1989 are, in fact, due to pumping for field drainage by a single facility in an area that



received precipitation as much as ten inches in excess of normal. The withdrawals that occurred in that area were 22% of the statewide total. With this 22% removed, the 1989 agricultural withdrawals are nearly the same as those in 1986, 1987 and 1990. Thus, withdrawals for crop irrigation during 1989 could be considered near normal.

Because the large field drainage facility was registered in 1989, it is very likely that the reported statewide agricultural withdrawals prior to that year are too low. The facility probably operated during isolated flooding events in the area in 1987 and 1988 as well as during 1986 when precipitation was near normal.



RURAL USE AND MISCELLANEOUS: The withdrawals in these two categories constitute a very small percentage of the statewide total. As seen in Figure 14, the most prominent feature of the record in these categories is a seemingly large increase in ground water withdrawals during 1989. This is largely due to the fact that in that year the Division of Water began registering temporary construction dewatering facilities as ground water withdrawals in the miscellaneous category. Although such facilities usually operate only for a short time, they can have a significant impact on ground water levels in the vicinity of the project. Had such dewatering activities been registered earlier, the withdrawals in these categories for 1986 through 1988 would be much higher.

WATER USE BY GEOGRAPHY

Geography is another factor to consider in reviewing Indiana's water use. Roughly 80% of the water withdrawn in the state is surface water from the abundant resources of Lake Michigan and the Ohio, Kankakee, Wabash and White rivers. The majority of significant water withdrawal facilities are withdrawing the remaining 20% in areas where the water resource is less accessible.

Table 1 is a listing of the number of million gallons of water withdrawn in each county in the state from 1986 to 1990. Also included is a column showing the major water use category in each county for the five year period. It is possible for the largest category in a county to account for much less than half of the total withdrawals. Thus, a final column has been added to the table indicating the percentage of the total county withdrawals over the five year period that occurred in the category with the maximum water withdrawn.

The reasons given for changes in the withdrawal categories over the five year period explain some of the fluctuations seen in the withdrawals by county. However, smaller changes can influence the county figures. Additional factors that contribute to the fluctuations of withdrawals in several counties include

variability in small power generating station withdrawals and discontinued or increased pumping by sand and gravel operations. An explanation for each county is beyond the scope of this report.

WATER USE BY COUNTY: 1986-1990

(TABLE 1)

Withdrawals in Million Gallons

COUNTY	1986	1987	1988	1989	1990	CATEGORY OF MAXIMUM USE	PERCENT OF TOTAL
Adams	1740.01	1962.70	1903.49	1132.02	1796.13	INDUSTRIAL	50.26
Allen	15618.36	15766.66	16657.35	16156.42	15847.54	PUBLIC SUPPLY	80.12
Bartholomew	3902.13	4312.63	5179.19	5008.14	5396.99	PUBLIC SUPPLY	66.91
Benton	204.58	203.21	198.95	212.07	215.67	PUBLIC SUPPLY	99.85
Blackford	697.74	646.63	766.22	743.81	823.45	PUBLIC SUPPLY	76.23
Boone	779.38	617.28	724.04	852.28	885.78	PUBLIC SUPPLY	81.84
Brown	19.80	18.80	21.25	22.90	23.65	PUBLIC SUPPLY	94.80
Carroll	573.34	534.23	504.46	509.69	623.02	PUBLIC SUPPLY	58.53
Cass	2130.35	2780.54	12086.03	8894.06	9613.12	ENERGY PRODUCTION	58.70
Clark	5735.54	5507.43	4771.84	5847.49	6154.38	PUBLIC SUPPLY	73.15
Clay	536.56	330.76	161.03	1491.01	846.57	ENERGY PRODUCTION	59.80
Clinton	1087.27	1169.35	1302.16	1228.60	1292.14	PUBLIC SUPPLY	98.11
Crawford	1391.78	1202.34	1373.64	1839.86	2039.60	INDUSTRIAL	53.67
Daviess	2122.23	2124.87	2884.91	3256.36	3488.87	PUBLIC SUPPLY	37.29
Dearborn	220362.88	166804.72	217438.92	252953.77	285198.16	ENERGY PRODUCTION	98.24
Decatur	667.68	663.98	731.81	783.81	943.79	PUBLIC SUPPLY	97.09
Dekalb	1826.28	1817.51	2028.38	1752.79	1683.94	PUBLIC SUPPLY	64.06
Delaware	4237.36	4820.10	5209.60	4843.19	4881.78	PUBLIC SUPPLY	89.21
Dubois	1599.35	1853.16	2138.95	2014.41	2015.45	PUBLIC SUPPLY	98.70
Elkhart	10161.43	11359.87	12731.42	11121.43	10119.24	PUBLIC SUPPLY	45.50
Fayette	1638.92	1696.50	1713.97	1593.24	1567.26	PUBLIC SUPPLY	99.35
Floyd	73256.60	92899.38	72774.96	102934.98	84430.20	ENERGY PRODUCTION	97.81
Fountain	969.97	1089.03	1046.11	905.18	646.56	INDUSTRIAL	57.76
Franklin	392.10	375.45	399.66	408.65	366.57	PUBLIC SUPPLY	73.03
Fulton	1381.87	1469.87	2311.82	1627.77	887.10	AGRICULTURAL	72.18
Gibson	18517.55	21135.66	17706.17	14628.20	13102.08	ENERGY PRODUCTION	93.50
Grant	3310.10	4713.02	4838.36	3296.91	3628.35	PUBLIC SUPPLY	72.98
Greene	1013.61	1350.95	1577.42	9110.83	6723.53	AGRICULTURAL	63.96
Hamilton	10335.39	13071.20	15091.51	15443.51	14481.55	INDUSTRIAL	55.68
Hancock	984.19	1029.96	1058.62	1027.54	1072.54	PUBLIC SUPPLY	94.69
Harrison	489.20	558.25	589.14	645.89	649.97	PUBLIC SUPPLY	84.71
Hendricks	2025.93	1341.09	1542.68	1465.91	1491.45	PUBLIC SUPPLY	80.19
Henry	1838.56	1680.18	1832.94	1808.35	1793.88	PUBLIC SUPPLY	77.08
Howard	5618.23	5640.49	6205.73	4973.27	5136.96	PUBLIC SUPPLY	86.32
Huntington	1153.03	1323.36	1755.87	1304.13	1698.34	PUBLIC SUPPLY	79.99
Jackson	1541.07	1614.00	1993.70	1835.91	2124.60	PUBLIC SUPPLY	66.89
Jasper	7460.98	9041.41	13838.82	13526.16	14402.47	ENERGY PRODUCTION	64.11
Jay	955.97	867.64	1085.33	1142.34	1043.61	PUBLIC SUPPLY	64.88
Jefferson	478061.03	490565.28	482621.16	478558.66	467613.50	ENERGY PRODUCTION	99.70
Jennings	751.54	759.54	851.82	991.33	1058.70	PUBLIC SUPPLY	65.47
Johnson	2965.74	3159.16	3477.71	3264.12	3303.75	PUBLIC SUPPLY	94.63
Knox	5369.13	14589.80	14289.07	10539.67	9686.44	ENERGY PRODUCTION	77.87
Kosciusko	4085.45	4192.09	5094.09	4620.44	3537.50	INDUSTRIAL	41.10
Lagrange	2412.66	2946.93	4798.98	3249.72	2634.79	AGRICULTURAL	72.27
Lake	794228.81	815247.31	856717.88	847415.13	838370.19	INDUSTRIAL	63.82
LaPorte	49214.83	58400.91	57039.24	36180.37	37881.52	ENERGY PRODUCTION	83.77
Lawrence	2620.91	1506.12	2448.99	2372.53	2341.47	PUBLIC SUPPLY	68.06
Madison	8333.68	8224.21	7802.93	7841.35	6328.76	PUBLIC SUPPLY	69.00
Marion	109803.23	108489.26	117936.57	114291.08	114790.30	PUBLIC SUPPLY	43.92

WATER USE BY COUNTY: 1986-1990

(TABLE 1 CONTINUED)

Withdrawals in Million Gallons

COUNTY	1986	1987	1988	1989	1990	CATEGORY OF MAXIMUM USE	PERCENT OF TOTAL
Marshall	1316.01	1490.47	2359.81	2054.68	1804.22	PUBLIC SUPPLY	65.40
Martin	721.95	683.72	740.48	711.95	726.57	PUBLIC SUPPLY	78.17
Miami	1816.07	1456.92	4252.93	2605.26	2217.95	PUBLIC SUPPLY	41.66
Monroe	4691.52	5075.43	5469.01	4873.34	4764.95	PUBLIC SUPPLY	96.45
Montgomery	1475.47	1415.98	1577.98	1605.76	1728.66	PUBLIC SUPPLY	67.72
Morgan	34817.64	34162.98	39997.55	34530.78	40377.70	ENERGY PRODUCTION	93.81
Newton	1711.71	1383.46	2811.76	1479.57	797.51	AGRICULTURAL	78.30
Noble	1379.10	1435.82	1469.57	1411.38	1328.88	PUBLIC SUPPLY	69.33
Ohio	173.05	163.99	171.28	169.15	168.85	PUBLIC SUPPLY	100.00
Orange	708.99	697.37	674.41	571.23	585.79	PUBLIC SUPPLY	91.24
Owen	369.28	452.29	414.21	523.90	309.71	PUBLIC SUPPLY	66.44
Parke	481.90	492.63	875.13	356.28	343.15	PUBLIC SUPPLY	66.09
Perry	789.15	734.70	664.84	699.39	631.36	PUBLIC SUPPLY	97.86
Pike	170934.98	179874.83	153513.34	170782.36	186954.16	ENERGY PRODUCTION	99.72
Porter	234583.78	237294.42	241466.47	239878.55	261177.61	INDUSTRIAL	63.86
Posey	5395.08	5936.24	5979.16	5546.95	5848.00	INDUSTRIAL	53.82
Pulaski	1338.85	2305.65	3494.57	2316.79	1351.45	INDUSTRIAL	50.16
Putnam	1575.44	1466.47	1693.60	1651.84	1702.07	PUBLIC SUPPLY	84.72
Randolph	1292.37	1239.05	1406.59	1366.48	1240.40	PUBLIC SUPPLY	65.61
Ripley	834.27	845.91	864.61	802.23	944.84	PUBLIC SUPPLY	87.15
Rush	680.50	827.19	880.38	799.28	933.86	INDUSTRIAL	52.67
St. Joseph	24630.30	25454.90	29925.66	28571.82	23878.08	PUBLIC SUPPLY	43.48
Scott	862.34	946.85	1103.91	1200.68	1335.53	PUBLIC SUPPLY	69.07
Shelby	1469.00	1649.77	1945.16	1932.44	2204.07	PUBLIC SUPPLY	55.84
Spencer	8366.86	7762.02	8819.53	15281.78	13081.34	ENERGY PRODUCTION	91.21
Starke	697.06	668.96	1426.53	1049.73	666.81	AGRICULTURAL	68.50
Steuben	683.59	846.28	1087.45	629.97	654.99	PUBLIC SUPPLY	60.83
Sullivan	229989.27	186618.84	211517.91	246566.20	221381.78	ENERGY PRODUCTION	99.63
Switzerland	1429.52	1547.45	1463.04	1418.01	1428.51	INDUSTRIAL	85.34
Tippecanoe	13760.94	13855.53	15190.96	14490.09	14246.50	PUBLIC SUPPLY	49.46
Tipton	363.76	380.80	411.00	406.08	386.64	PUBLIC SUPPLY	93.37
Union	49.19	68.46	106.45	95.23	84.07	PUBLIC SUPPLY	82.43
Vanderburgh	11170.30	11670.52	11544.23	10404.29	10734.56	PUBLIC SUPPLY	97.66
Vermillion	205003.91	193660.22	170972.02	184783.11	174678.70	ENERGY PRODUCTION	97.90
Vigo	109266.48	136990.81	167011.95	152978.44	141675.45	ENERGY PRODUCTION	93.15
Wabash	2459.92	2427.39	2999.28	3486.93	3263.97	PUBLIC SUPPLY	56.57
Warren	1819.20	2039.20	2207.80	1897.28	1536.65	INDUSTRIAL	86.98
Warrick	186306.31	205530.89	216691.48	236145.16	248551.14	INDUSTRIAL	59.04
Washington	738.95	701.28	746.00	904.46	759.21	PUBLIC SUPPLY	81.05
Wayne	3629.31	3466.03	3799.11	4981.08	5134.38	PUBLIC SUPPLY	68.49
Wells	594.76	736.40	779.86	711.20	679.32	PUBLIC SUPPLY	88.07
White	1193.98	1332.99	1725.75	1247.24	1230.53	PUBLIC SUPPLY	38.27
Whitley	591.62	638.00	506.66	717.42	691.50	PUBLIC SUPPLY	64.44



FOR MORE INFORMATION CONTACT

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